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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/683,534	10/10/2003	Lawrence S. Melvin III	SNPS-0524	2616

36503 7590 12/14/2006

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EXAMINER	
PIERRE LOUIS, ANDRE	

ART UNIT	PAPER NUMBER
2123	

DATE MAILED: 12/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	**Application No.** 10/683,534	**Applicant(s)** MELVIN, LAWRENCE S.	
	Examiner Andre Pierre-Louis	**Art Unit** 2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 October 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

1. The amendment filed on 10/20/2006 has been received and fully considered; claims 1-35 are presented for examination.

2. With regards to the objections to the drawings, the examiner withdraws the objection in view of the amendment.

3. As per the rejection under 35USC 112, the examiner withdraws the rejection, in view of the amendment.

4. Regarding the rejection under 35USC 101, the examiner withdraws the rejection of claims 1-33,in view of the amendment. However, claims 34-35 stand rejected under 35 USC 101, as the applicant fails to overcome the rejection.

5. With regards to the rejection under 35 USC 102(e), using Liu as a reference to reject the independent claims, the examiner withdraws the rejection, in view of the amendment.

6. During examination of the amended claims, the examiner notices that the claims includes new features that deal with the *gradient which now includes both magnitude and angle*; and *generate a mask for fabricating an integrated circuit*, however, none of the claim are patentably distinct, as evidenced by the rejection set forth below.

Claim Objections

7. Claims 34 and 35 are objected to because of the following informalities: The steps performed would not produce the IC and/or the mask as claimed. Appropriate correction is required.

Claim Rejections - 35 USC § 101

8. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

The claimed invention as a whole must accomplish a practical application. That is, it must produce a "useful, concrete and tangible result." State Street, 149 F.3d at 1373, 47USPQ2d at 1601-02. The purpose of this requirement is to limit patent protection to inventions that possess a certain level of "real world" value, as opposed to subject matter that represents nothing more than an idea or concept, or is simply a starting point for future investigation or research (Brenner v. Manson, 383 U.S. 519, 528-36, 148 USPQ 689, 693-96); In re Ziegler, 992, F.2d 1197, 1200-03, 26 USPQ2d 1600, 1603-06 (Fed. Cir. 1993)). Accordingly, a complete disclosure should contain some indication of the practical application for the claimed invention, i.e., why the applicant believes the claimed invention is useful. However, the mere fact that the claim may satisfy the utility requirement of 35 U.S.C. 101 does not mean that a useful result is achieved under the practical application requirement. The claimed invention as a whole must produce a "useful, concrete and tangible" result to have a practical application.

8.1 Claims 34-35 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The claims do not produce a useful, tangible, concrete result. **See MPEP 2106.**

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9.0 Claims 1-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al. (USPG_PUB No. 2003/0061587), in view of Pierrat et al. (U.S. Patent No. 6,453,457).

9.1 In considering the independent claims 1,12,23,34, and 35, Zhang et al. substantially teaches a method for dissecting a layout of an integrated circuit based on modeled intensity gradients to produce a segmentation for an optical proximity correction (OPC) process, and particularly teaches the steps of: receiving the layout for the integrated circuit *(fig.5 (502) pg.3 (0048-0049))*; generating a segmentation for edges in the layout based upon the intensity gradients, wherein the segmentation is used by a subsequent OPC process in generating corrections for the layout *(see fig.5 (506), para 0029-0034);*however, he does not clearly teaches the step of performing a model-based simulation on the layout to generate intensity gradients along edges of features in the layout, wherein the intensity gradients include both magnitude and angle; wherein the OPC correct layout is used to generate a mask for fabricating an integrated circuit. *Pierrat et al. substantially* teaches the step of performing a model-based simulation on the layout to generate intensity gradients along edges of features in the layout wherein the intensity gradients include both magnitude and angle (*see fig.4-5*); wherein the OPC correct layout is used to generate a mask for fabricating an integrated circuit (*fig.2-3, col.8 lines 30-50*). The examiner asserts that the correction is applied used the rule-based teaches by Pierrat et al.; however, Zhang et al. teaches biasing an edge (*fig.5 (516)*) and updated layout at step 520 in fig.5. and that Zhang et al. teaches performing both rule-based and model-based proximity correction and output a circuit layout with optical proximity correction (*see para 0013-0018*). Zhang and Pierrat et al. are analogous art because they are from the same field of endeavor and that the model analyzes by Pierrat et al. is similar to that of Zhang et al. Therefore, it would have been obvious to one ordinary skilled in the art at the time of the applicant invention to combine the fabrication techniques of Pierrat et al. with the method and apparatus of Zhang et al. because Pierrat et al. teaches the advantage of using previously computed model runs to analyze differences after the edges get dissected and the advantage of customizing the dissection for certain important edges and responding to the actual variation of proximity affects (*see col.21 lines 3-26*).

9.2 As per claims 2,13, and 24, the combined teachings of Zhang et al. and Pierrat et al. substantially teach that the step of generating the segmentation involves: determining segment lengths for edges in the layout based upon the intensity gradients along the edges *(see Zhang et al. fig.4-5, pg.2 (0029-0034), also see Pierrat et al. fig.9, col.20 lines 59-67);* and using the segment lengths to dissect the edges in the layout, thereby generating the segmentation for the layout *(see Zhang et al. fig.5, pg.3-4 (0048-0059), also see Pierrat et al. fig. 9).*

9.3 With regards to claims 3,14, and 25, the combined teachings of Zhang et al. and Pierrat et al. substantially teach that identifying a segment length for an edge involves using a predetermined association to map an intensity gradient angle to the segment length *(see Zhang et al. fig.4-5, pg.2-3 (0029-0034 and 0048-0059)).*

9.4 Regarding claims 4,15, and 26, the combined teachings of Zhang et al. and Pierrat et al. substantially teach that generating the segmentation involves selecting a segmentation for a line-end in the layout from a set of predetermined line-end segmentations based upon intensity gradients associated with the line-end *(see Zhang et al. fig.5 (510), pg.3 (0048-0059 and 0039-0040), also see Pierrat et al. fig.9).*

9.5 As per claims 5,16, and 27, the combined teachings of Zhang et al. and Pierrat et al. substantially teach that the segmentation for the line-end is selected based upon a magnitude of an intensity gradient associated with the line-end *(see Zhang et al. fig.4-5, pg.1-2 (0009-0012 and 0030-0034)).*

9.6 With regards to claims 6,17, and 28, the combined teachings of Zhang et al. and Pierrat et al. substantially teach that performing the model-based simulation on the layout involves: dividing each edge in the layout into minimum-sized segments *(see Zhang et al. fig.4-5, pg.1-2 (0009-0011 and 0030), also see Pierrat et al. col.5 line 31-col.6 line 42)*; and performing a model-based simulation to determine an intensity gradient for each minimum-sized segment *(see Zhang et al. fig.4-5, pg.1-2 (0009-0012 and 0030-0034), also see Pierrat et al. fig. 3-5).*

9.7 Regarding claims 7,18, and 29, the combined teachings of Zhang et al. and Pierrat et al. substantially teach that determining a gradient for a given minimum-sized segment involves performing a model-based simulation at two tangential points along the segment to determine a tangential component of the gradient *(see Zhang et al. fig.5, pg.3 (0048-0059), also see Pierrat et al. fig.3, 7 &9).*

9.8 As per claims 8,19, and 30, the combined teachings of Zhang et al. and Pierrat et al. substantially teach that determining the gradient for the given minimum-sized segment involves performing a model-based simulation at two points along a normal to the segment to determine a normal component of the gradient *(see Zhang et al. fig.4-5, pg.3 (0048-0059), also see Pierrat et al. fig.3, 7 & 9).*

9.9 With regards to claims 9,20, and 31, the combined teachings of Zhang et al. and Pierrat et al. substantially teach the step performing the dissection again on problem areas in the layout after initial OPC operations take place *(see Zhang et al. fig.5, para (0042-0045 & 0054), also see Pierrat col.26 lines 18-44).*

9.10 Regarding claims 10,21, and 32, the combined teachings of Zhang et al. and Pierrat et al. substantially teach the step reducing the number of segments in areas that prove to be simpler to correct than predicted after initial OPC operations take place *(see Zhang et al. fig.4-5, pg.1-2 (0002-0012 and pg.3 (0048-0059)).*

9.11 As per claims 11,22,33, the combined teachings of Zhang et al. and Pierrat et al. substantially teach prior to receiving the layout, the method further comprises calibrating the association between gradients and segment lengths by: modeling an intensity gradient across a test pattern *(see Pierrat et al. fig.6-7, col.15 lines 8-67, also see Zhang et al. fig.4-5*; identifying target regions in the test pattern that have a large amount of correction shift variation *(see Pierrat et al. fig.5, col.5 lines 8-col.6 line 42 & see Zhang et al. pg.3 (0030-0034));* mapping intensity gradients to the target regions *(see Pierrat et al. fig.5, col.5 lines 8-col.6 line 42 & see Zhang et al. pg.3 (0030-0034));* associating segment lengths with the target regions *(see Pierrat et al. fig.5, col.5 lines 8-col.6 line 42 & see Zhang et al. pg.3 (0030-0034));* and producing an association between intensity gradients and segment lengths in the target regions, whereby the association is subsequently used in generating the segmentation for the layout *(see Pierrat et al. fig.5, col.5 lines 8-col.6 line 42 & see Zhang et al. pg.3 (0030-0034)).*

10. Claims 1,12,23,34, and 35 are further rejected under 35 U.S.C. 103(a) as being unpatentable over Pierrat (U.S. Patent No. 7,010,764), in view of Pierrat et al. (U.S. Patent No. 6,453,457).

10.1 Regarding claims 1,12,23,34, and 35, Pierrat '764 substantially teaches a method for dissecting a layout of an integrated circuit based on modeled intensity gradients to produce a segmentation for an optical proximity correction (OPC) process, and particularly teaches the steps of: receiving the layout for the integrated circuit *(see fig.17 (1701)*; performing a model-based simulation on the layout to generate intensity gradients along edges of features in the layout, wherein the intensity gradients include both magnitude and angle (*col.5 line 21-col.6 line 31)*; and generating a segmentation for edges in the layout based upon the intensity gradients, wherein the segmentation is used by a subsequent OPC process in generating corrections for the layout *(see col.5 line 21-col.6 line 67);* wherein the OPC correct layout is used to generate a mask for fabricating an integrated circuit (*see fig.17 (1706))*. Although Pierrat does not clear expressly state that the intensity gradient includes magnitude and angle, Pierrat '764 fig.5-9, 11 show many figures with maximum values and angles (see for example ϒ, θ and arrows 803,904, which the examiner considers to a substantial equivalence of the gradient magnitude claimed). Nevertheless, Pierrat et al. '457 gradient model substantially includes both magnitude and angle (see fig.4-5) and further teaches masking of the output (*see fig.2-3, col.8 lines 30-50*). Pierrat '764 and Pierrat et al. '457 are analogous art because they are from the same field of endeavor and that the model analyzes by Pierrat et al. '457 is similar to that of Pierrat '764. Therefore, it would have been obvious to one ordinary skilled in the art at the time of the applicant invention to combine the fabrication techniques of Pierrat et al. with the proximity effect correction methodology of Pierrat '764 because Pierrat et al. '457 teaches the advantage of using previously computed model runs to analyze differences after the edges get dissected and the advantage of customizing the dissection for certain important edges and responding to the actual variation of proximity affects (*see col.21 lines 3-26).*

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

11.1 Mukherjee et al. (U.S. Patent No. 7,043,712) teaches a method and adaptive segment refinement in OPC.

11.2 Abrams et al. (U.S. Patent No. 7,124,394) teaches a method for time-evolving rectilinear contours representing photo masks.

12. Claims 1-35 are rejected and Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andre Pierre-Louis whose telephone number is 571-272-8636. The examiner can normally be reached on Mon-Fri, 8:00AM-4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul L. Rodriguez can be reached on 571-272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

December 2, 2006

APL

12/2/06

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